REMARKS

Rejections Under 35 U.S.C. § 103

Claims 43-49, 52-62, and 65-78 stand rejected under 35 U.S.C. 103(a) as unpatentable over Greskovich in view of Banerjee et al and further in view of Manwiller. Applicants respectfully disagree.

Obviousness requires some suggestion or motivation to combine the references. There is no suggestion or motivation to combine Manwiller with Greskovich. Greskovich and Manwiller use completely different molding processes to achieve products with completely different purposes. The invention of Manwiller is not directed to an investment mold at all. The slurry composition of Manwiller is not used to form a mold; instead, the slurry is itself cast in a mold to create a microabrasive tool. In Greskovich, the materials are selected to provide a mold suitable in high temperature molding applications and capable of withstanding the effect of mold-metal reactions at the mold-metal interface (col. 1, lines 47-50, 55-58). In contrast, the materials in Manwiller are selected to provide a suitable microabrasive tool. The role of the components used to create a mold for investment casting are very different from those used to create a microabrasive tool. For example, in the mold taught in Greskovich, the alumina dissolves in the aluminasilicate phase to form a reaction product. (col. 3, line 66 to col. 4, line 1). In contrast, in Manwiller the alumina is used as an abrasive, which is held in place by the bonding material. (col. 3, lines 21-31). When the cast microabrasive product is used, "mechanical forces . . . break down the bond, which holds the abrasive grains in a skeletal structure . . . [and the] surface of the microabrasive stick retreats, and fresh abrasive grains embedded within the skeletal structure are continuously exposed to cut the surface of the workpiece." (col. 6, lines 43-53). Thus, Greskovich and Manwiller use completely different molding processes to achieve products with completely different purposes.

Additionally, in Manwiller teaches away from using gellan gum for an investment casting process. The gellan gum in Manwiller is used as a cross-

linking polymer and requires a cross-linking agent. After the materials are mixed together, the cast slurry is cooled to a temperature of below about 45° C (preferably to as low as -25° C), which causes ionic linking of the polymers. (col. 5, lines 61 to col. 6, line 2). In contrast, in investment casting, the mold must be heated to melt the wax model, so the slurry is not deliberately cooled to such a low temperature (e.g. see Greskovich, col. 3, lines 43-55). In fact, the present application notes that, after the mold dries, it can be immediately heated to remove the substrate. (¶ 15-16). Thus, although Manwiller teaches the use of gellan gum, it requires an additional material (a crosslinking agent) and an additional step (cooling), but it is does not teach what the advantage to the combination is for an investment casting method. Thus, Manwiller teaches away from using a gellan gum for an investment casting process. The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills,* 916 F.2d 680 (Fed. Cir. 1990). Because one skilled in the art would not be motivated to combine Manwiller with Greskovich, claims 43-49, 52-62, and 65-78 are not obvious. Applicants respectfully request that the rejections be withdrawn.

Additionally, claims 48, 69, and 77 are not obvious for the additional reason that none of the above references teaches or suggests an alumina component with particles of screen size 6x14 at about 0% to about 10% by weight of the composition and particles of screen size 14x70 at about 40% to about 60% by weight of the composition. The claimed screen size of 6x14 corresponds to 1.1 to 3 mm and screen size 14x70 corresponds to 0.2 to 1.1 mm. (¶ 17, lines 6-10 of present application). Greskovich emphasizes the criticality of the particle size, noting that the average particle size of the alumina "has a very pronounced effect" on the mold. (col. 2, lines 48-52). Thus, it is known in the art that particle size has an important effect on the properties of the mold in investment casting, and it would not be obvious to use the claimed particle size. The alumina particle size in Greskovich is around 35 microns,

orders of magnitude smaller than required in claims 48, 69, and 77. (col. 2, lines 52-55).

Nor does Banerjee teach the claimed particle size. It should be noted that Banerjee is not even directed to investment casting. Banerjee teaches a casting composition including alumina at particles sizes 25% at 4mm, 20% at 1 mm, 15% at 0.2 mm, and 5% at 0.05 mm. (col. 3, line 67 to col. 4, line 5). The combination of 1 mm and 0.2 mm particles in Banerjee is thus only 35%, which is lower than the 40% required in the claims for particles of screen size 14x70 (0.2 to 1.1 mm). Additionally, claims 48, 69, and 77 have a maximum limit of 10% for particles of screen size screen size of 6x14 (1.1 to 3 mm), while Banerjee teaches 25% particles with an average diameter of 4 mm. Thus, the overall particle size taught by Banerjee is significantly larger than that claimed in claims 48, 69, and 77.

Thus, none of the cited references teach or suggest the particle distribution of claims 48, 69, and 77. Applicants respectfully request that the rejections be withdrawn.

Claims 65, 70, and 78 are not obvious for the additional reason that none of the references teaches or suggests the use of welan gum. Although Manwiller teaches the use of gellan gum, it does not teach or suggest the use of welan gum. The gelan gum of Manwiller is used as a crosslinked polymer. Manwiller notes that suitable polymers "can be rapidly cross-linked." (col. 4, lines 38-41) None of the cited references teaches that welan gum could be used as a crosslinking polymer. In an unpredictable technology area such as chemistry, it would not be obvious to substitute one polymer for another polymer with completely different properties. Therefore, claims 65, 70, and 78 are not obvious. Applicants respectfully request that the rejections be withdrawn.

Claims 54 and 68 are not obvious for the additional reason that none of the references teaches or suggests the use of polypropylene fiber in the slurry. Contrary to the Examiners' assertion, Manwiller makes no mention of polypropylene fiber or any other type of fiber. Applicants respectfully request that the rejections be withdrawn.

Claims 74-76 are not obvious for the additional reason that none of the cited references teaches or suggests the coating of a substrate with no more than three, two, or one coat of the slurry composition. The investment casting method of Greskovich requires 14 steps, alternating between coating with a slurry and then sprinkling with a fused alumina stucco aggregate. (col. 3, lines 37-39). Greskovich does not teach or suggest that a suitable mold could be made in as few as one, two, or three steps. Therefore, claims 74-76 are not obvious. Applicants respectfully request that the rejections be withdrawn.

Furthermore, method claims 55-77 are not obvious for the additional reason that the claimed invention eliminates a step from the prior art while retaining the function of that step. Although this issue was previously raised by the Applicants, the Examiner has not addressed this issue in the previous Office Actions. Omission of an element or step with the retention of an element or step's function is an indicia of unobviousness. (MPEP 2144.04). The investment casting method of Greskovich requires 14 steps, alternating between coating with a slurry and then sprinkling with a fused alumina stucco aggregate. (col. 3, lines 37-39). Greskovich does not teach or suggest that the process could be used without the steps of sprinkling with stucco, or without using multiple layers of coatings. The present invention uses a slurry that can be applied in as few as one or two coatings (¶ 7, lines 1-3; Example 1), and does not require the use of an aggregate in addition to the slurry coating. Therefore, the present invention eliminates the multiple steps required in Greskovich, and also eliminates the step of applying an aggregate after applying the slurry coating, while retaining the function of creating an acceptable investment casting mold. Therefore, claims 55-77 are not obvious. Applicants respectfully request that the rejections be withdrawn.

Claims 50 and 63 stand rejected under 35 U.S.C. 103(a) as unpatentable over Greskovich in view of Banerjee et al and further in view of Manwiller and Schramm. For the same reasons described above for claims 43-49, 52-62, and 65-77, there is no suggestion or motivation to combine Manwiller with

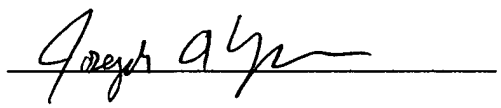
Greskovich. Therefore, claims 50 and 63 are not obvious. Applicants respectfully request that the rejections be withdrawn.

Claims 51 and 64 stand rejected under 35 U.S.C. 103(a) as unpatentable over Greskovich in view of Banerjee et al and further in view of Manwiller and Doles. For the same reasons described above for claims 43-49, 52-62, and 65-77, there is no suggestion or motivation to combine Manwiller with Greskovich. Therefore, claims 51 and 64 are not obvious. Applicants respectfully request that the rejections be withdrawn.

SUMMARY

Applicants believe the present application is now in condition for allowance. If the Examiner has any remaining issues, he is invited to contact the undersigned attorneys for the Applicant via telephone if such communication would expedite this application.

Respectfully submitted,



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